

**REMARKS**

Review and reconsideration on the merits are requested.

**Formalities**

Applicants appreciate the Examiner approving the drawings, acknowledging receipt of the single priority document from the International Bureau and returning one initialed PTO/SB/08.

**DETAILED ACTION**

**Elections/Restrictions**

The Examiner is correct.

**Specification**

A new Abstract is provided which is not written in two paragraphs which excludes the legal term "comprises" and which has only 147 words.

With respect to the informalities in the specification the Examiner has pointed out, the same are corrected.

Withdrawal is requested.

**Claim Objections**

Withdrawn claims 1-5, 12 and 13 are identified with the appropriate status identifiers.

Withdrawal of the objection is requested.

**Claim Rejections - 35 U.S.C. § 112, Second Paragraph**

Applicants address the rejection of claims 9, 14, 15, 17 and 18 in the order posed.

The Examiner is correct that "shaft" should be replaced with "axle" to provide proper antecedent basis with "a center axle" of independent claim 6.

With respect to "a perpendicular", Applicants simply change "a perpendicular" to --perpendicular-- and believe this responds to the rejection.

If the Examiner feels some other language would be more appropriate, the Examiner is requested to contact the undersigned since Applicants remain flexible with respect to this language in claim 9.

Withdrawal is requested.

**The Prior Art**

U.S. 2002/0187060 Decker et al (Decker); JP 2002-113749 (JP '749); U.S. 5,394,933

Takayanagi (Takayanagi).

**Claim Rejections - 35 U.S.C. § 103**

Claims 6-9, 11, 14, 15 and 17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Decker in view of JP '749.

Claims 10, 16 and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Decker in view of JP '749 further in view of Takayanagi.

The Examiner's position is set forth in the Action and will not be repeated here except as necessary to an understanding of Applicants' traversal which is now presented.

**Traversal of Art Rejections**

**Problems to be Solved by Decker**

Decker discusses the problems in producing compressor wheels by the investment casting method. This discussion occurs especially in paragraphs [0019] to [0024].

**The Decker Solutions**

This is discussed in paragraphs [0028] to [0030] of Decker.

**Solution 1**

Decker proposes to use a simplified blade design of a Ti compressor wheel (See paragraphs [0030] to [0036] of Decker. According to paragraph [0033], a wax pattern can be formed in a die consisting of one or more die inserts per compressor wheel air passage (i.e., the

space between the blades), preferably two die inserts per air passage. In contrast, in the present invention, “each of the slide dies has a groove, having a bottom of the same form as the splitter blade, and a form corresponding to that of a space between an adjacent pair of the full blades”. (see claim 6)

### **Solution 2**

See paragraph [0037] of Decker. Decker recommends using two or more inserts per air passage. This would permit the manufacture of wax molds, and thus compressor wheels, of greater complexity, and thus a more complex shape. In the case of two inserts per air passage, the pulling direction would not necessarily be the same for each member of the pair of the inserts.

### **Differences Between Decker and the Present Invention**

#### **Decker**

In Decker solution 1, a simplified blade design of a Ti compressor wheel is adopted in order to enable one or more inserts to be easily retracted or pulled backwards when producing a wax pattern. In solution 2, two or more inserts per air passage are used.

#### **The Present Invention**

The blade design of the present invention is not particularly limited. Because each slide die is moved radially outwardly, it can freely rotate itself around a motional line of the radially outwardly moving slide die. (See paragraphs [0015] on pages 11 to 12, and [0020 to 0022] on pages 17 to 19 of the present specification). See also the object of the invention given at page 5, lines 3 to 7 of the present specification, and the effect of the invention given at page 9, lines 3 to 9 of the present specification.

Specifically, at page 5, lines 3 to 7, note the remark that “high aerodynamic performance is expectable” and at page 9 lines 3 to 9, note the language “no parting line-correspondence portion is present on the hub surface and the blade surfaces in the space defined by the blades.”

A single insert per air passage is used as called for in claim 6 which recites:

“wherein the step (a) of forming the sacrificial pattern is a process of injecting a sacrificial material into a cavity defined by a plurality of slide dies which are arranged radially toward the center axle, and *each of which has a groove, having a bottom of the same form as the splitter blade, and a form corresponding to that of a space between an adjacent pair of the full blades...*”.

**JP ‘749**

JP ‘749 is somewhat similar to the present invention, but contains no teaching of the following aspects in claim 6:

“forming the sacrificial pattern is a process of injecting a sacrificial material into a cavity defined by a plurality of slide dies which are arranged radially toward the center axle, and *each of which has a groove, having a bottom of the same form as the splitter blade, and a form corresponding to that of a space between an adjacent pair of the full blades; and subsequently moving the slide dies radially outwardly, while freely rotating themselves around respective motional lines of the radially outwardly moving slide dies thereby releasing them from the sacrificial pattern”.*

Further, in JP ‘749, after completion of projection molding of the wax model, each of the slide dies is radially linearly retracted with a rotational component of movement while in contact with the curved surface of the slide plate (8) and the curved surface (10) of the part (7) of the slide die.

It should be specifically noted that the rotational movement of the slide die is determined by the fixed relationship between the curved surfaces of the slide plate (8) and the slide die. In distinction to JP '749, in the present invention, the slide dies are freely rotated when they are opened.

Further, JP '749 is silent on the presence of a groove in the slide die, which is a cavity for forming a splitter blade. In distinction to JP '749, the present invention, since the slide die has a groove for forming the splitter blade, and is supported freely rotatably as earlier discussed, in accordance with the present invention it is possible to use a single slide die per air passage between a pair of full blades.

Applicants respectfully submit that this last feature of the present invention as compared to JP '749 would not be obvious to one of ordinary skill in the art from the teaching of the references relied upon by the Examiner.

In the attached partial translation of JP '749, attached is page (4) of the Japanese text of JP '749 which Applicants have provided with some annotations on the Figures. Note specifically the annotations on Figure 1 "no splitter blade!!" and "full blades!!".

**Takayanagi**

Although Takayanagi discloses a lost wax casting method for producing a pump impeller, Takayanagi is silent on an impellor for superchargers having both of full and splitter blades.

Withdrawal of all rejections and allowance is requested.

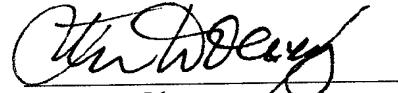
AMENDMENT UNDER 37 C.F.R. § 1.111  
Application No.: 10/573,966

Attorney Docket No.: Q94029

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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**Partial translation of JP-A-2002-113749**

**Title of invention: Dies for injection molding**

**Disclosed is a structure of dies for injection molding by which a wax model or pattern is molded. The wax model is used for producing an impeller by lost wax precise casting.**

**Paragraph [0010]: --- Fig. 1 is a front general view of a wax model of an impeller, which was molded by a die machine. The impeller (1) comprises a conical central-boss (2), and a plurality of blades (3) which are provided on a peripheral surface of the boss (2) in a radial pattern. Although only two blades are shown in the drawing, actually the wax model has fourteen blades. ---**

**Paragraph [0012]: --- Fig. 4 is an enlarged view of a slide plate (8), having a curved surface, which is secured to a stationary die. Fig. 5 is an enlarged view of a part (7) of a slide die. The part (7) has a curved surface (10) corresponding to the slide plate (8). ---**

**Paragraph [0014]: At first, the movable die (4) is opened. Next, the part (7) of the slide die is pulled back or retracted along a groove radially outwardly. (\*Translator's Note: The**

**groove will be different from a groove (9) mentioned below. Probably, the groove is one of a plurality of grooves extending radially outwardly, which are formed in the stationary die 5.) During movement of the part (7), a projection (11) is guided by the groove (9) which is provided to the slide plate (8), having curved surface (10), which is secured to the stationary die. The ~~projection (11)~~ moves at an angle along the projection (11), so that the slide die is pulled back not only linearly but also rotatably.**

## 【0015】

【発明の効果】本発明によれば、オーバーラップしたブレードを有するインペラの均質で安定したワックス模型を製造する上で生産能率を飛躍的に改善することができ、ロストワックス精密鋳造法によるインペラの製造にとって欠くことのできない技術となる。

## 【図面の簡単な説明】

【図1】インペラのワックス模型の全体を示す正面図である。

【図2】射出成形用金型全体の矢視図をである。

【図3】固定金型5およびスライド金型の要部7（明確化のため1個のみ示している）の矢視図である。

【図4】固定側金型に取り付けられている曲面部を有するスライド板の状態を示す拡大図である。

【図5】スライド金型の要部の拡大図である。

## 【符号の説明】

インペラ

ボス部

ブレード

可動側金型

固定側金型

スライド金型

スライド金型要部

スライド板

スライド板溝

曲面部

突起

ブレード面

